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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/622,532	07/18/2003	Won Kwon Lee	29936/39477	2813

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MARSHALL, GERSTEIN & BORUN LLP
233 S. WACKER DRIVE, SUITE 6300
SEARS TOWER
CHICAGO, IL 60606

EXAMINER	
DEO, DUY VU NGUYEN	
ART UNIT	**PAPER NUMBER**
1765	

DATE MAILED: 11/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/622,532	LEE, WON KWON	
	Examiner	Art Unit	
	DuyVu n. Deo	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 September 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-9* is/are allowed.

6)☒ Claim(s) *10-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 10-12, 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yu (US 5,998,278), Koh (US 2003/0022458), and Williams et al. (US 6,589,897).

Yu teaches a method for forming shallow trench isolation comprising: forming a stack structure of pad oxide layer 21, a polysilicon layer 22, a photoresist layer pattern on a semiconductor substrate; removing the photoresist pattern (col. 2, line 45-65; fig. 2B, 2C); oxidizing the polysilicon surface to form a surface oxide film 22b, this would form oxide layer on the sidewall and top surface of the polysilicon layer (col. 3, line 26-30); forming an insulating layer over the entire structure to bury a trench (col. 2, line 67-col. 3, line 12); polishing the insulating layer (claimed isolation film) (col. 3, line 13-15); removing the polysilicon (or the oxide film 22b) and the pad oxide layer 21 (col. 3, line 31-34). Figure 2G in Yu shows the width at the top of the insulating film 27a is wider than its bottom. This would read on claimed of the width of the top of the isolation film is widened up to an active region in the substrate.

Unlike claimed invention, Yu doesn't describe the stack include an amorphous silicon layer but a polysilicon layer 22. Koh (US 2003/0022458) teaches a same method where he teaches the stack structure can include either polysilicon or amorphous silicon layer (paragraph [0025]). Therefore, it would be obvious to one skilled in the art at the time of the invention in

light of Koh that using either polysilicon or amorphous silicon layer would be obvious and provide an expected result.

Referring to claims 11, 12, 18 Yu doesn't describe performing an over etch so that polymer formed at a corner of the isolation region to form an etch slant face at the corner of the isolation region while etching the central portion of the isolation. Williams et al. (US 6,589,897) teaches a method for forming the shallow trench isolation wherein he teaches of the above step using gases including CHF3 or CF4 (col. 4, line 50-56; col. 5, line 15-25). It would have been obvious for one skilled in the art to modify Yu in light of Williams' teaching because he teaches that it is desired to have a soft shoulder or trench tapering since it affect the performance and reliability of the semiconductor devices (col. 2, line 15-25, 64-67). Referring to claim 11, the amount or depth of the isolation during the over etch step would obviously depend on the desired depth of the type of the device being manufactured. Referring to claim 12, Williams teaches that the degree of shoulder shaping can be adjusted for different designs (col. 2, line 20-26). Therefore, it would have been obvious that the degree of tapering and the width of the slant faces ranges would have to be determined and adjusted through routine experimentation as suggested above by Williams in order to provide an optimum degree of shoulder shaping with a reasonable expectation of success.

Williams also teaches using of ARC to facilitate the photographic definition of the feature (col. 1, line 38-40, 53-56). Since the ARC must formed directly under the photoresist (or above other layers including the above polysilicon layer or amorphous layer) in order to facilitate the photographic definition, it would be obvious to remove the ARC in order to expose the polysilicon or amorphous layer for the oxidation step.

Referring to claim 16, the Yu's silicon nitride 23 would read on claimed hard mask (col. 2, line 53-54). Williams teaches that the polymer is to protect the silicon corner slope (col. 4, line 50-55). Therefore, the polymer would be mask when etching the silicon substrate (col. 5, line 28-30). Koh also teaches to form the oxide on the amorphous silicon surface (paragraph [0026]). Figure 2G shown by Yu teaches that all layers, which would includes the oxide film on the amorphous silicon surface, the amorphous silicon film, and the pad oxide would have to be etched away in order to form an isolation trench.

Referring to claims 14-17, even though above applied prior art doesn't suggest forming the surface oxide by method such as O2 ashing process at T 50-200 degree Celsius. However, at the time of the invention, using method such as O2 ashing plasma, which is known to one skilled in the art (please see Lee et al. US 6,277,707 col. 5, line 15-20), would be obvious in order to oxidize the amorphous or polysilicon layer to form an oxide layer with a reasonable expectation of success.

3. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yu, Koh, and Williams as applied to claim 10 above, and further in view of Kim et al. (US 6,461,937).

Referring to claim 13, figure 2B by Yu further shows the sidewall and bottom of the trench is oxidized to form a surface oxide before oxidizing the polysilicon. Unlike claimed invention he doesn't describe that this is done after removing the ARC film. Kim shows a same method of forming STI wherein he describes this oxidation step is done after removing the ARC film (col. 1, line 44-47). It would have been obvious for one skilled in the art to form a STI

further in review of Kim's teaching because Kim teaches a step that is silent by Yu in order to provide a method for forming a STI with a reasonable expectation of success.

4. Lee et al. US 6,277,707 col. 5, line 15-20, is cited to show prior art.

Priority

5. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in Republic of Korea 2002-84281 and 2002-65753 on 12/26/02 and 10/28/02. It is noted, however, that applicant has not filed a certified copy of these applications as required by 35 U.S.C. 119(b).

Allowable Subject Matter

6. Claims 1-9 remained allow.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claims 10-18 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. It is unclear where in the specification suggesting the width of the top of the isolation is widened up to an active region in the semiconductor substrate

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. Claims 10-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The new limitation "forming an isolation film, wherein the width of the top of the insulating film is widened up to an active region in the semiconductor substrate" is vague and unclear. What does it mean by widened up to an active region. At this time it is understand as the width of the top is wider than the bottom of the insulating film.

Response to Arguments

11. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the amorphous silicon layer is partly oxidized) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Referring to the new limitation that the top of the isolation film is widened up to an active region in the substrate. Yu shows the width at the top of the insulating film 27a is wider than its bottom. And since the insulating film 27a is a STI the region surround would be active region. This would read on claimed of the width of the top of the isolation film is widened up to an active region in the substrate.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n. Deo whose telephone number is 571-272-1462. The examiner can normally be reached on 6:00-2:30 Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Primary Examiner
Duy-Vu N. Deo
11/28/05